

# TP2 (JavaScript Version)

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INF8808 : Data Visualisation

Department of computer and software engineering



# POLYTECHNIQUE MONTRÉAL

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## Objectives

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The goal of this lab is to create an interactive scatter map using open data in JSON and GeoJSON format.

Before beginning, we recommend you have completed the following readings and practice exercises :

**Readings :** Chapters 13 and 14 of Scott Murray's book

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- Chapter 12 – 1, 2, 3

**Exercices :**

- Chapter 15 – 1
- Chapter 16 – 1, 2, 3, 4

## Introduction

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A scatter map is similar to a typical scatter plot, except the markers are positioned with respect to their geographic location on a map base. This type of chart is useful when the geographic context is important to our interpretation of the data.

In this lab, you will implement an interactive scatter map using data representing pedestrian paths in Montreal's streets, as well as data representing the limits of Montreal's boroughs. The street data [1] and the borough data [2] was extracted from the City of Montreal's open data portal. The datasets contains data representing various information about pedestrian and shared streets in Montreal, as well as the geometric limits of its boroughs.

## Description

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In this lab, you will have to complete the JavaScript code using D3 in order to display a scatter map displaying the geographical location and type of each pedestrian path in Montreal. To make the chart interactive, the name of each borough will appear centered in its polygon when hovered. You will also implement the code to display an informational panel when each marker is clicked. Additionally, there will be a legend indicating the color corresponding to each type of pedestrian street displayed on the chart.

Further, because the data contains points which are geographically nearby, displaying it directly on the chart results in overlapping points, and consequently, a potential loss of information. To solve this problem, D3's force layout will be useful to avoid collisions between markers in the map. Because the application of the force layout is animated, the viewer will still get an idea of each marker's original position on the map.

The following subsections present the different parts that you will have to complete for this lab. While you code, we recommend completing the data processing first, followed by the implementation of the scatter map itself. The next two parts, the legend and the information panel, are independent of each other.

## File Structure

To complete this work, you will need to fill the various **TODO** sections in the files from the archive provided for the lab. The comments in the code explain in more detail the steps to take.

In this lab, we provide you with an archive containing 6 JavaScript files used to accomplish the desired visualization :

- **index.js** : This file represents the entry point to the code and orchestrates the various steps needed to realise the visualization. It does not need to be modified.
- **scripts/helper.js** : This file contains some basic functions needed to display the visualization. It does not need to be modified.
- **scripts/legend.js**
- **scripts/panel.js**
- **scripts/preprocess.js**
- **scripts/viz.js**

## Dataset

In this lab, you will have to make a scatter map from the data representing Montreal and its pedestrian paths. The locations and information about the pedestrian paths are located in a separate file from the geographic divisions of the polygons representing Montreal's boroughs. Since this data comes from two different sources, you will have to handle the two files using different formats.

The first dataset, representing data on pedestrian paths, is located in the **src/assets/data/projetpietonnisation2017.geojson** file in the archive provided for the lab. The dataset contains many properties. The following properties may be useful for this lab :

- **MODE\_IMPLANTATION** : How long the pedestrian street will be implanted (e.g. permanent, temporary, etc.)

- **NOM\_PROJET**: Name of the project which led to the pedestrian street
- **OBJECTIF\_THEMATIQUE** : The intention behind the pedestrian street project (reading, taking photos, etc.)
- **TYPE\_SITE\_INTERVENTION** : The type of site where the pedestrian street project is located

The second dataset, representing data on contains all the geometries necessary to display the boroughs on a map, is located in the `src/assets/data/montreal.json` file in the archive provided for the lab. The dataset contains many properties. The following properties may be useful for this lab :

- **NOM** : Name of the borough
- **CODEID** : Unique identifier of the borough

## Data preprocessing

To begin, you will have to preprocess the data we provide you about the pedestrian streets. The data contained in the GeoJSON file is raw, so it is necessary to reorganize certain parts of it so they can be properly used by the D3 library. To do so, you need to complete the file `scripts/preprocessing.js`.

More precisely, you will have to complete these steps :

1. Generate the cartesian (x, y) coordinates of each marker from its longitude and latitude using the provided projection (function `convertCoordinates`)
2. Simplify the names which will later be displayed in the legend (function `simplifyDisplayTitles`)

To help validate your work, Snippet 1 illustrates a portion of the resulting data structure.

```
{
  "type": "FeatureCollection",
  "crs": { ... },
  "features": [
    {
      "type": "Feature",
      "properties": {
        "ID_PROJET": "RP0001",
        "TYPE_AXE": "Avenue", ...
      },
      "geometry": { ... },
      "x": 523.9884058026364,
      "y": 287.12224173489085
    }, ...
  ]
}
```

*Snippet 1 : Extract of preprocessed data*

## Scatter map

For this second part, you will have to implement the main part of the data visualization. First, you will draw the map base, including the polygons that represent Montreal's neighborhoods. When each neighborhood is hovered by the mouse, its name will appear at the center of its polygon. Calculating the centroid of its shape will be useful for this feature.

Once the base is drawn in grey with white outlines delimiting the neighborhoods, you will trace the markers representing the pedestrian paths. The colors of the markers depend on the type of site they represent (according to their property value for `TYPE_SITE_INTERVENTION`). The circles appear with a white outline and augment slightly in size when hovered. Their position depends on their longitude and latitude, which is transformed into (x, y) coordinates by the provided projection. In the final result, the provided code using D3's force layout to avoid collisions, the circles should move to a position where there is no overlap.

To follow these steps, you need to complete the file `scripts/viz.js`. More specifically, you must :

1. Define the color scale's domain, which will be used to set the markers' color based on the type of path they represent (function `colorDomain`)
2. Draw the map background with neighborhood names appearing at the center of each neighborhood when hovered (functions `mapBackground` and `showMapLabel`)
3. Draw the map markers representing the pedestrian streets (function `mapMarkers`)

Figures 1 and 2 illustrate what the map should look like after this step.

## Explorez les rues piétonnes de Montréal

Cliquez sur un marqueur pour plus d'information.

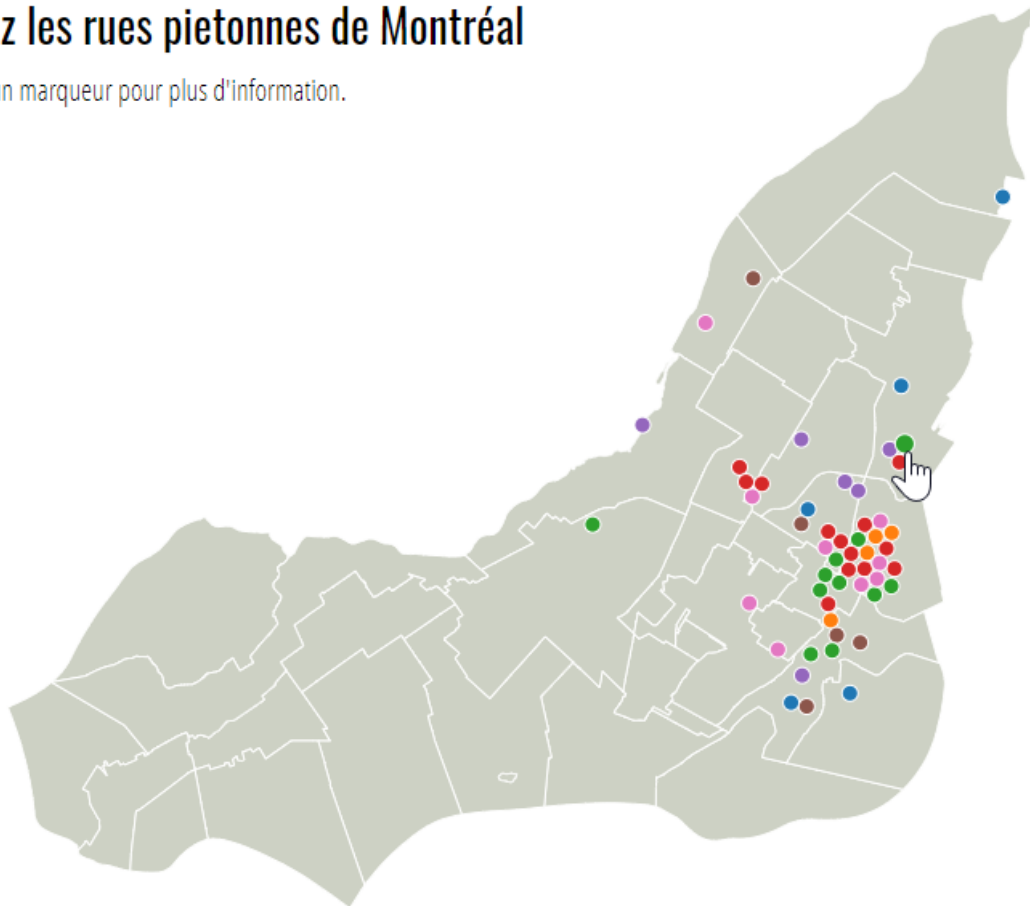


Figure 1 : The scatter map. The hovered marker is slightly larger than the others

## Explorez les rues piétonnes de Montréal

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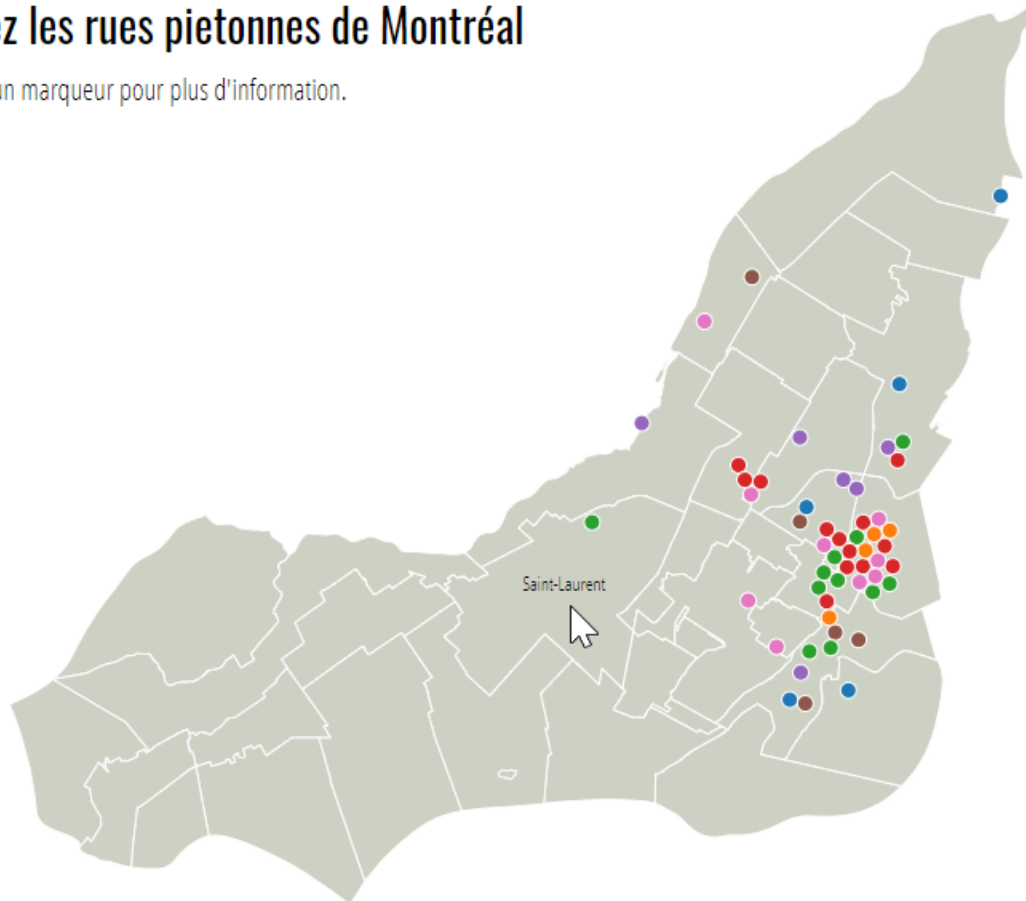


Figure 2 : The scatter map. The name for the neighborhood appears in its center when hovered by the cursor

## Legend

For this third part, you will generate a legend at the top right of the heatmap. The legend will indicate continent each color corresponds to in color scale. Some of the code for this part may be completed using the [d3-svg-legend](#) library [3], which is already imported at the top of the file. Make sure the site names appear in alphabetical order and that the markers for the legend are represented as circles.

The resulting legend should look like the one in Figure 3.

# Explorez les rues piétonnes de Montréal

Cliquez sur un marqueur pour plus d'information.

## Légende

- Noyau villageois
- Passage entre rues résidentielles
- Rue bordant un bâtiment public ou institutionnel
- Rue commerciale de quartier, d'ambiance ou de destination
- Rue en bordure ou entre deux parcs ou place publique
- Rue entre un parc et un bâtiment public ou institutionnel
- Rue transversale à une rue commerciale



Figure 3 : The legend

## Information panel

For this fourth part, you will generate an informational panel which appears to the left of the map when a marker is clicked. Part of the structure for this part is already provided for you in the file `scripts/panel.js`, which you will have to complete. The panel should contain as title the name of the project, written in the same color as its associated marker. Further, below its title, it should have a subtitle indicating the intended duration of the site (permanent, temporary, etc.). When available, the panel should also list the intended themes for the site, presented in the format of an unordered list.

The steps to follow for this part are :

1. Display the title (function `setTitle`)
2. Display the subtitle containing the mode (permanent, temporary, etc.) (function `setMode`)
3. Display the intended theme for the site when the information is available (function `setTheme`)

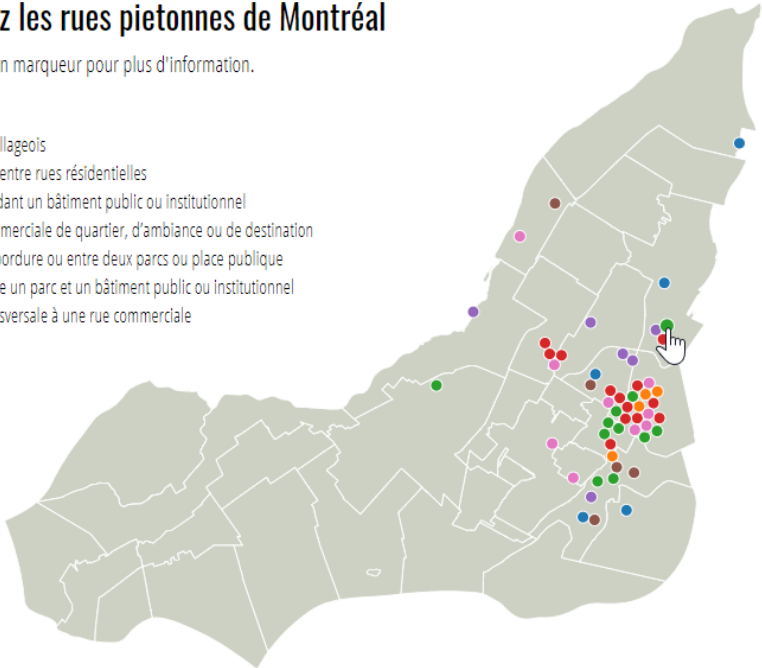
Figure 4 gives an example of what the panel contains when one of the markers is clicked.

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Légende

- Noyau villageois
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FERMER

**Patio Culturel**  
Temporaire saisonnière

Thématique :

- Photo
- Jeu/exercice
- Insolite
- Lecture

Figure 4 : The information panel showing information about the "Patio Culturel" project

## Submission

The instructions for the submission are :

1. You must place your project code in a compressed ZIP file named [matricule1\_matricule2\_matricule3.zip]
2. The lab must be submitted before [June 12th 23h59m]

## Evaluation

Overall, your work will be evaluated according to the following grid. Each section will be evaluated on correctness and quality of the work.

Requirement	Points
Data preprocessing	3
Scatter map	10
Legend	2
Information panel	4
Overall quality and clarity of the submission	1
Total	20

## References

[1] Service de l'urbanisme et de la mobilité / Arrondissements, "Rues piétonnes et partagées ," Montréal : Portail de données ouvertes. Available: <http://donnees.ville.montreal.qc.ca/dataset/rues-pietonnes> [Accessed 01 09 2020].

[2] Service des infrastructures du réseau routier - Division de la géomatique, "Limite administrative de l'agglomération de Montréal (Arrondissements et Villes liées)," Montréal : Portail de données ouvertes. Available: <http://donnees.ville.montreal.qc.ca/dataset/polygones-arrondissements> [Accessed 01 09 2020].

[3] Susie Lu, "D3 SVG Legend ," d3-legend. Available: <https://d3-legend.susielu.com/> [Accessed 01 09 2020].